14 September 1960

Dear Dick: PROGRESS REPORT #12

This report covers activities on the airframe development of the A-12 program during the month of August. In view of the imminence of a suppliers' meeting within the next few days, the more technical aspects of such phases as the A.R. program will not be discussed in detail. They will be presented fully at that time.

[redacted]

2. MATERIALS

Because of action taken during this month, material in the form of titanium billets and extrusions is beginning to appear in substantial quantities. We have now had enough experience, both here and with a number of vendors, to evaluate a problem which appears to be extremely

critical. This has to do with the extreme cost in machining the material into extrusions and finished sections. Machining costs are running three to four times initial estimates, and the waste factor, estimated initially at 60%, is much greater, due to the inability of the titanium suppliers to push extrusions close to the final required size. It is almost mandatory that we double the machine rate within the next two months, and that within five months we speed it up by a factor of about ten. At the same time, we are doing everything possible with TMC to get them to push extrusions and forged billet stock closer to final dimensions. Under the pressure of getting material to us, they are sending us billets six inches thick, where our order calls for 3.5 inches. We are being billed for the 3.5 inch thickness, but their kindness is killing us, in that we have to machine away so much more stock that the costs are out of hand on certain large fittings.

There are a few bright spots in the machining picture, and this is due to the fact that, on the original hogged-out pieces, we are copying the shapes on a magnesium block, so that the future parts should come through with about 30% of the machining time that it took to make the initial ones. In other words, there will be an excellent learning curve on some of our toughest fittings. There seems to be none, however, on extrusions. We will put a full time engineer on this problem, to survey not only the machine
25X1A shops who work for us but also Air Force and university sources, as well as [redacted] to see what major steps can be taken in titanium machining. To the best of our knowledge, we are very competitive with
25X1A other users of titanium, such as the engine industry, but over-all, I feel it necessary to make a breakthrough on the basis of cost. The savings we are aiming for are in terms of [redacted]
25X1A contracts to [redacted] or any known competent organization would aid in solving these problems, I think we should spend the money.

The supply of titanium sheet is adequate, and construction of the sheet metal parts is proceeding at a high rate, using our new process. Very little salvage was actually obtained on the original group of parts that were heat treated in the original manner. Most of these pieces were lost after being annealed, because of under-gauge conditions resulting from double cleaning and low gauges after stretching. Several months ago we instituted a procedure whereby we obtained sheet metal .002 inches thicker than the nominal gauge, in order to account for thinning down and acid cleaning. This procedure is now paying off and we have very little rejection due to under-gauge conditions.

3. STATIC TESTS

A great many detailed static tests have gone forward to develop the optimum wing structure. These have been very gratifying in the high strengths obtained and, actually, reduced gauges are in order over a considerable area of the wing, subject to the final analysis for stiffness under aeroelastic effects. Tests on control cables have solved the problem of material, and we have been able to design tool steel bearings which successfully passed static tests under 550° operating temperatures. In spite of a great deal of advertising of high temperature bearings, we were not able to buy these from any manufacturer and have been forced to develop our own design and tests. These bearings are being purchased at about ten times the cost of low temperature bearings.

4. EJECTOR TEST

The initial ejector is held up by a lack of material for the large fittings. Tail flaps are complete, the mounting stand is complete, and we are just beginning to get some of the major fittings.

5. AIRCRAFT SYSTEMS

The systems designs are proceeding well, with a great deal of time being taken up in arguing with vendors about cost. It is again obvious that the A-12 is being forced to pioneer and assume the costs of development of many items which would have been developed for the F-108 and B-70, had these programs gone forward. We are now leading the B-70 in development of such things as the hydraulic and electrical systems, based on an examination we made recently when North American put their aircraft mockup and systems on display. One item which we may have to finance that has been unplanned for is the development of high temperature ejection seat initiators and seat ejection rockets. We were amazed to find that the Air Force and the X-15 are using equipment in which the powder is critical at 165°F. There has been one case of a seat being ejected due to ignition of the rocket charge caused by high cockpit pressures generated through a closed canopy on a parked aircraft. I believe that the development costs for the 300° initiators and catapults should be assumed directly by the Air Force. I have had some discussions with General Flickinger on this subject and expect to pursue them.

6. ENGINEERING

The engineering status on the project is very good and for the first time in history there is no pressure from the shop on getting drawings out.

7. TOOLING

The major jigs will be available easily by the time we have the machined components necessary to put in them. Tooling cannot be classified as a major problem at this time.

8. NOSE TEST SECTION

The 25 foot nose test section, built for static and temperature tests, should be complete within a month. This has been very useful to us in training our personnel in handling the material, as well as developing the nose tooling.

9. SIMULATOR TESTS

A great deal of work has been done on the NASA simulator at Ames. We found it necessary to provide a great deal of our company equipment, in terms of computers and electronic gear, to simulate three-axis flight conditions. Briefly, these tests indicate that artificial stabilization is absolutely required in the high speed regime. Simulating complete failures of all systems and trying to fly the airplane at rear c. g. by manual means resulted, invariably, in a condition referred to by the pilot as "instant death." We have been able to investigate the effect of losing different parts of the system and of different rates of application of controls. Our choice of using multiple stability augmentors and our general fail-safe design procedures seems to be very much in order. Testing will continue to simulate engine-out conditions on takeoff at the test area. Within a month, we should be flying the F-100 rigged to simulate, as far as possible, the flight conditions of the A-12, at least for transient maneuvers.

10. SCHEDULES.

The revised schedule discussed on my recent trip east is attached. It indicates a delay of slightly under four months in the flight date of the

first aircraft, and a delay of one month in the delivery of the 12th aircraft. Every effort was made to reduce the latter to zero, but this could not be done, due to the time required in the jigs on certain major components.

Sincerely,

Kelly

cc: E. K.
J. P. ✓
Encl.

REVISED FLIGHT DATES A-12

ARTICLE NO.	ORIGINAL FLIGHT DATE	REVISED FLIGHT DATE	ROLLOUT AT BURBANK
1	5/1/61	8/30/61	60 days before flight
2	8/3/61	12/1/61	45 days " "
3	10/18/61	1/4/62	30 " " "
4	12/20/61	2/12/62	30 " " "
5	2/7/62	3/15/62	30 " " "
6	3/7/62	4/16/62	30 " " "
7	4/11/62	5/14/62	30 " " "
8	5/11/62	6/10/62	30 " " "
9	6/13/62	7/9/62	30 " " "
10	7/11/62	8/9/62	30 " " "
11	8/10/62	9/6/62	30 " " "
12	9/5/62	10/4/62	30 " " "

per schedule as of 9/14/60